



Ground Water Protection in Virginia

2002 Annual Report of the Ground Water Protection Steering Committee

James City County Taking Care of Old Wells

In January 2002, the JCSA launched "Cap It," an innovative ground water protection program that educates James City County residents on the dangers of open wells and provides proper well abandonment at no cost to the homeowner.

The JCSA estimates that hundreds of old, open, or improperly abandoned wells are spread throughout the County. Each represents a significant danger to our drinking water sources, but many residents do not realize the threat or cannot afford to abandon the well.

With \$20,000 of JCSA money and

\$16,550 from a 106 Ground Water Protection Grant from the Va. Department of Environment Quality, the JCSA set aside funding for approximately fifty-five abandonments, and produced an educational brochure, an advertising campaign in the local newspaper and a website (www.bewatersmart.org). The educational campaign explained the dangers of open wells and encouraged well owners to apply for free abandonment. In the *Cap It's* first six months, the JCSA received over eighty applications and expects to close fifty-five wells. Twelve of the newly abandoned

wells are drilled wells to the Chickahominy-Piney Point Aquifer, and represent the greatest threat to our public drinking water supply. The remaining are shallow bored wells that represent a danger to the shallow aquifers that many people still use for drinking water and to people and animals that may fall into them.

As of June 2002, eighteen applications have already been approved for closure in the next fiscal year. The JCSA plans to continue the program indefinitely using its own funds, and will

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PERSPECTIVE

The Year in Review

The 16th year of the Ground Water Protection Steering Committee has been one of many themes. After September 11th, some members reported uncertainty over budgets and concern about the potential for bio-terrorism to contaminate ground water. Over the year, domestic issues raised more concerns. Much reporting centered on the persisting drought conditions resulting from low rainfalls since 1999. Committee members faced management challenges for a depleted ground water supply due to a long-term hydrologic drought. September 2001-February 2002 was the driest such period in 105 years of record-keeping. A few 30-year old monitoring wells registered historic lows. The Committee's role is increasingly important, as hydrologic droughts

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Virginia Water Resources Research Center Report

During the years 2001-2002, the Virginia Water Resources Research Center funded two ground water studies. *Geologic and Hydrodynamic Modeling to Evaluate the Occurrence of the Virginia Inland Salt Wedge Associated with the Chesapeake Bay Impact Crater*, a study being conducted by Thomas Burbey, Geological Sciences, Virginia Tech, will develop conceptual and numerical models that simulate the geologic and hydrodynamic evolution of the aquifer system from the meteor impact that occurred 35 million years ago in the Williamsburg area creating a large inland salt wedge. Another study *A Non-Evasive Cost-Efficient Methodology for Identifying Production Zones and Recharge Source Areas in Fractured or Faulted Rocks* funded by the Water Center investigates the development of an adequate and defensible wellhead protection program or a cost-efficient ground water monitoring program in complex crystalline aquifers. Researchers Thomas Burbey and William Seaton, Geological Sciences, Virginia Tech, are using a field site in Floyd County, Virginia as the prototype for the development of this methodol.

STEP

As part of the Water Center's mission of education and outreach, the Service Training for Environmental Progress (STEP) is administered by the Center in partnership with the Virginia Tech Service-Learning Center and provides students with hands-on experience. Through STEP, students live in Virginia communities for eight weeks and work on water-related projects identified by the community. In the sum-

mer of 2001, two STEP interns Kelley Raftery and Sudipto Sengupta initiated a baseline data collection for a ground-water carrying-capacity study in Clarke County, Virginia. They integrated the data collected into the county's geographic information system (GIS) and researched the methods that could assist Clarke County in conducting a carrying-capacity study. In addition, the interns designed a database for entering the data from well-drillers' logs.

Annual Symposium

The Virginia Water Resources Research Center will host its annual VIRGINIA WATER RESEARCH SYMPOSIUM 2002 in Richmond, Virginia on November 6-7 at the Sheraton Richmond West (formerly the Hyatt). **DRINKING WATER SUPPLIES ASSESSMENT AND MANAGEMENT STRATEGIES FOR THE 21st CENTURY** is the theme of this year's symposium. The symposium provides an opportunity for the presentation of the most recent research and technical reports and to facilitate discussion of mutual issues and problems across a wide range of disciplines among those individuals interested in water supply and drinking water issues. Over the last 30 years, there has been an increased awareness among water planners, governmental administrators, research scientists, and water professionals that water has an economic and environmental value and is a vulnerable resource. This heightened awareness highlights the need that water assessment, management, and planning, in combination with new policies and strategies, must be adopted within the next decade to address the drinking water

issues facing Virginia and the nation. Problems that confront water users, planners, researchers, and policy makers are the lack of adequate water supplies due to droughts and regional water management conflicts, pollutants, aging infrastructure and water distribution systems, ground water supply and availability, alternative water sources, unsafe and inadequate water in rural and isolated communities, and source water protection.

The Water Center would like to encourage any one involved in drinking water supply, management, or affected by regulatory policy, consulting engineers, government regulators, municipal utility managers and private operators, researchers, students, and others concerned with drinking water to attend this symposium.

For more information, contact Judy Poff at jupoff@vt.edu,
(540) 231-8030,
or fax (540) 231-6673.



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continue to seek supplemental funding from outside sources.

In recognition of the innovation and success of *Cap It*, The Environmental Protection Agency awarded *Cap It* the 2002 Region III Source Water Protection Award for the Commonwealth of Virginia. The award recognizes and encourages leadership, innovation, and dedication to source water protection.

Pesticide and Pesticide Container Disposal Programs

In an effort to protect our ground water, the Virginia Department of Agriculture and Consumer Services (VDACS) conducted two special projects that offer the agricultural community an environmentally responsible alternative for the disposal of unused pesticides and pesticide containers. The Pesticide Disposal Program removes unwanted pesticides from the waste stream, eliminating the possibility that these chemicals will be dumped or disposed of improperly and thus ensuring that they do not find their way into the ground water. The Plastic Pesticide Container Recycling Program removes tons of plastic pesticide containers from the Commonwealth's overburdened sanitary landfills and eliminates the potential for pesticide residues in these containers to leak and thus contaminate ground water.

Plastic Pesticide Container Recycling Program

Disposing of used plastic pesticide containers in a manner that does not threaten the environment poses a challenge for agricultural producers and custom applicators. Typically, pesticide applicators dispose of their empty, clean plastic pesticide containers by hauling them to the local sanitary landfill or by burning them.

Virginia's container recycling program began in 1993 in six localities with more than 35,000 containers recycled. In 2001, 16 localities, 13 pesticide dealership locations and one commercial pesticide applicator participated in the program by recycling 82,859 plastic pesticide containers. This means that more than 62,000 pounds of plastic did not go to a landfill and a total of almost 503,000 containers has been recycled since 1993.

Virginia's Plastic Pesticide Container Recycling Program has been a cooperative effort between VDACS and local governments. Local governments under national guidelines developed by the *Ag Container Recycling Council* administer the program. Several recycling sites have been established to accept properly rinsed plastic pesticide containers. Other sites will be established as the program expands. Trained local personnel inspect all pesticide containers. Containers are then granulated by a contractor with assistance from VDACS and local personnel. Granulated chips are transported to recycling facilities and fabricated into items such as pallets, fence posts, field drain tiles and parking stops.



Pesticide Disposal Program

The disposal of canceled, banned or unwanted pesticides poses a significant challenge to agricultural producers and other pesticide users due to its high cost.

The proper disposal of waste pesticides eliminates a potential threat to health and the environment.

Virginia's Pesticide Disposal Program has been a cooperative effort among VDACS, Virginia Cooperative Extension, Virginia Department of Environmental Quality and Virginia Department of Conservation and Recreation. The program is available to agricultural producers, pesticide dealers and pest control firms within selected localities at no cost. Virginia localities are selected for participation primarily based upon the quantity of pesticide waste stored by potential participants.

Collection began on September 20, 2001 and was completed on September 25, 2001. A total of 97,931

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The Ground Water Protection

Steering Committee

meeting is held the third Tuesday of every other month

(January -- March -- May -- July -- September -- November)

**All are Welcome
to Attend**

Meetings are normally held at the Department of Environmental Quality, 629 East Main Street, Richmond, from 9 a.m. to 11:00am.

For more information, contact Mary Ann Massie, Department of Environmental Quality, at (804) 698-4042

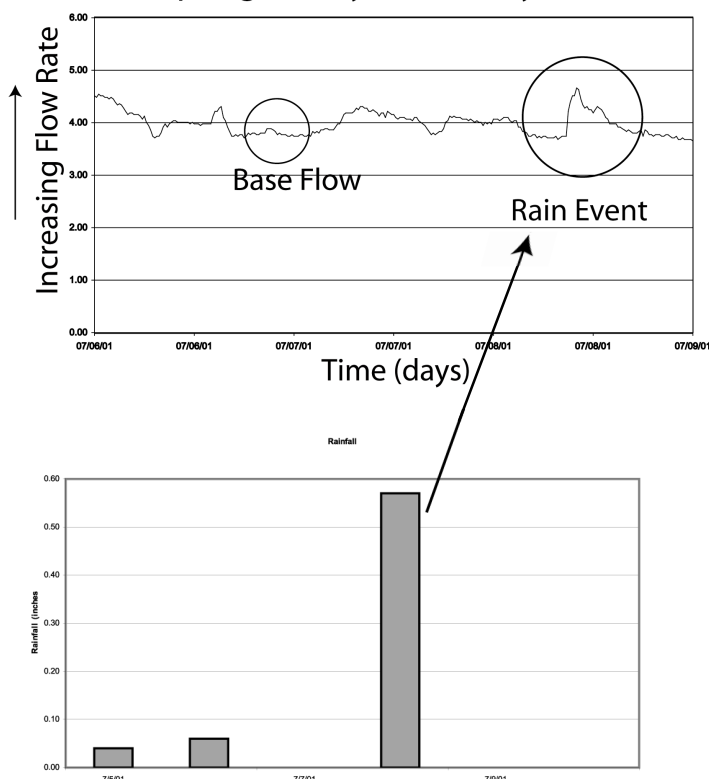
Springhead Protection Research

Most people are familiar with spring water in some respects as springs are ubiquitous throughout the Commonwealth. In most urban areas spring water is often used as a potable drinking source. It's a commonly held belief that water issuing from springs represents a clean, pure source that is always fit to drink. Unfortunately, this belief is not true. Most springs issuing from the ground are not fit for use as drinking water. Research at Virginia Tech is focusing on determining specific recharge areas and flow pathways of spring water as well as developing a protection plan for these locations.

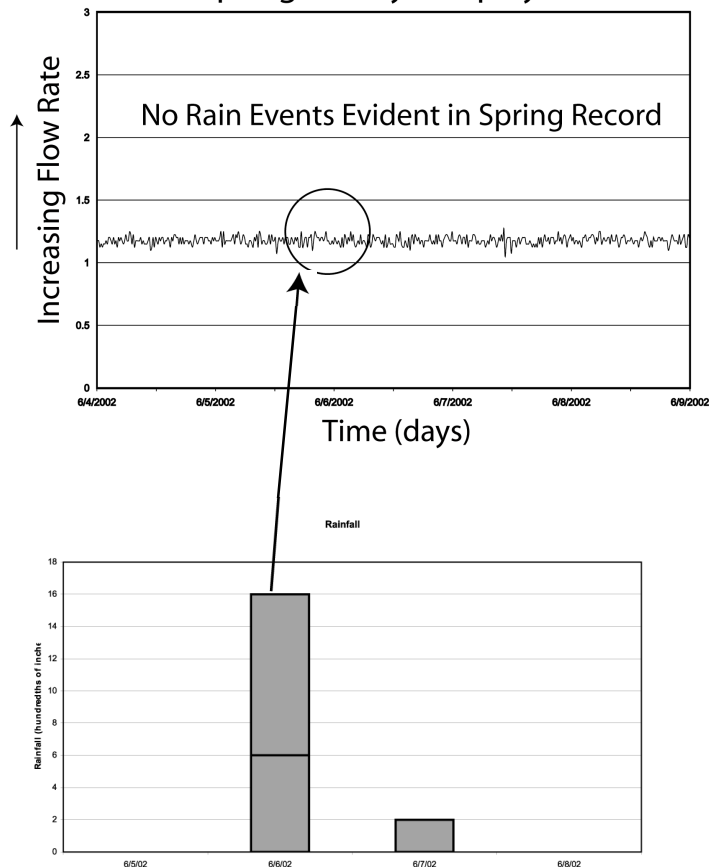
Within the Blue Ridge Province springs have been used for decades as sources of water in areas where drilling is expensive and ground water resources are hard to locate. Recent research performed by the Hydrogeosciences group in the Virginia Tech Department of Geologic Sciences has focused on determination of the origin and flow pathways for these springs. Chemical, biological, and physical factors are being utilized to characterize and categorize springs in an attempt to determine how to protect these valuable resources.

Most research performed thus far has focused on a Floyd County site, located on the western edge of the Blue Ridge Province. The Floyd

Spring Fed by Shallow System



Spring Fed by Deep System



County site is typical of many spring locations in the Blue Ridge, which has a relatively thin (0-25 ft) soil/saprolite cover underlain by fractured crystalline rock. Springs can be divided in to two groups using qualitative observations. Most springs either flow perennially, or flow only during periods of prolonged wet weather (typically late fall through spring). Of these two groups, it is suspected that perennial springs in the Blue Ridge are fed by deeper, and possibly cleaner aquifer systems with more distant recharge source areas. Ephemeral springs are likely fed by shallower aquifer systems with local recharge source areas. The latter type is more susceptible to surface pollution, making it less suitable for water resources exploitation.

A method known as springflow hydrograph analysis is being employed in an attempt to determine possible recharge mechanisms and flow pathways. If spring hydrographs respond quickly to rainfall events, the spring may be connected to a shallow aquifer system, and easily susceptible to surface pollution. If the spring does not respond to rainfall events, the connection to the shallow aquifer system may be weaker, providing some isolation from pollution of the ground-water system. Once the general source of the water is known (shallow aquifer

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Virginia Ground Water Festival

The Department of Environmental Quality, with many partners, hosted a Ground Water Festival on Friday, September 21, 2001. The event was held in the Coastal Plain Physiographic Province at Camp Kittamaqund in Burgess VA. 130 sixth-grade students attended from Northumberland Middle School. The students rotated through six interactive educational sessions to receive instruction on ground water occurrence and ground water protection. The children were enthusiastic as they learned about the formation of springs, the hydrologic cycle, watershed concepts including quantity and quality issues, onsite sewage disposal, choosing alternative cleaning products to reduce impacts to the environment, and geographic information systems. The students even hiked through the woods to visit a spring on the property! Our partners for the event were US EPA Re-



Scott Bruce from DEQ and Jody Aston from DCR demonstrate a ground water flow model to Northumberland Middle School students.



Students participate in a session on springs.

gion III, National Project WET, The Perrier Group, VA Dept Conservation and Recreation, VA Dept of Environmental Quality-Tidewater Regional Office, VA Institute of Marine Science, VA Dept of Mines, Minerals, & Energy, US Geological Survey, Northern Neck Soil and Water Conservation District, Northumberland County Health Department, Northumberland County High School, SAIF Water Committee/Interfaith Service Council, VA Rural Water Association, and the VA Ground Water Protection Steering Committee.

Another Festival is planned for Fall 2002. For more information contact Mary Ann Massie, VA DEQ Office of Water Resources Management, at (804) 698-4042.

Continued from Pesticides page 3

pounds of pesticide waste was collected from 179 agricultural producers, pesticide dealers and pest control firms. Some unknown materials were field analyzed, while others had to be sent to the laboratory for analysis. Once identified, a specialized contractor properly disposed the materials.

Since the program's inception in 1990, almost 917,000 pounds of pesticide waste have been collected and disposed from greater than 2,000 participants. Over 2 million dollars has been expended to carry out the program which has been funded by EPA grants and pesticide fees collected by VDACS. No general fund tax dollars have been used to conduct this program.

The 2001 Pesticide Disposal Program was the third year of a four-year maintenance phase for the program.

The 2002 program will complete the second round of collections in all Virginia localities.



Spread the Word!!!

Do you know of an individual or organization who would benefit from receiving a copy of this and future Annual Ground Water Reports?

Call Mary Ann Massie
(804) 698-4042

<http://www.deq.state.va.us/gwpssc>

Ground Water Protection Steering Committee Website

Do you want to learn more about the Steering Committee's work? Or find web sites with ground water information? Let us know what you think of the site while you're there!

<http://www.deq.state.va.us/gwpssc>

Ground Water Studies in Virginia by the U.S. Geological Survey During 2002

During 2002, the U.S. Geological Survey continues to carry out several cooperatively funded hydrologic investigations of Virginia's ground water resources. These investigations are providing relevant and reliable hydrogeologic information that will contribute toward assessing, managing, and protecting the Commonwealth's groundwater resources. Among the current efforts, the statewide Virginia Aquifer Susceptibility Study, being conducted in cooperation with the Virginia Department of Health, has age-dated ground water from public water supply wells in Virginia's major aquifer systems to define its natural sensitivity to contamination from near surface sources, and to guide future source-water assessment activities. The data collection, analysis, and interpretation phases of the project are complete and results will be provided in a published report in the coming year.

In another project, assessment of the availability of ground water in the northern Shenandoah Valley carbonate and siliciclastic aquifer systems continues this year in cooperation with the counties of Frederick, Warren, and Clarke. This work is focusing on an evaluation of existing information, an inventory of wells, and development of a ground water data collection network. These data, along with seepage measurements on selected streams, are being used to calculate water balances for the aquifer systems.

Data collection also continues in the Polecat Creek watershed where, in cooperation with the Chesapeake Bay Local Assistance Department, the USGS is assessing ground water as a nutrient transport pathway to streams draining to Chesapeake Bay. This study, which included age-dating of

ground water, has provided new information on nutrient transport times in ground water in shallow Piedmont and Coastal Plain aquifers.

The USGS also is completing an assessment of the Virginia Beach shallow aquifer system. New data on the hydrogeologic framework of this complex aquifer system have been incorporated into a ground water model, and the potential for salt-water intrusion is being evaluated using particle-tracking techniques.

Finally, the characterization of the Chesapeake Bay Impact Crater and development of a new Coastal Plain ground water flow model continues this

year. This large-scale effort is being carried out in cooperation with the Virginia Department of Environmental Quality and the Hampton Roads Planning District Commission.

Discovery of the Chesapeake Bay impact crater has led to profound implications for the nature and future development of heavily used ground water supplies in eastern Virginia. (See article in 2000 Annual Report "Ancient Blast from Space Leaves Lasting "Impact" on Eastern Virginia's Ground Water".) Hydrologic analyses were performed on sediment core obtained by drilling at the NASA Langley Research Center in Hampton, Virginia during 2000, and at North and Bayside in Mathews County During 2001. Among the results, the salinity of pore water squeezed from the core (see photo) indicates a complex zone of mixing of freshwater and seawater around the outer margin of the crater, along which ground water flow is likely diverted. Other chemical data indicate that the seawater was possibly emplaced during high sea levels prior to the Pleistocene Epoch over 2 million years ago, and that some of the seawater was concentrated by evaporation. Results of these analyses will be provided in a published report in the coming year. Similar analyses will be undertaken at an additional deep test hole being drilled into the crater in Newport News during 2002. Information generated by these investigations is being incorporated during the next several years into regional analyses of the Virginia Coastal Plain aquifers to provide an improved understanding of the crater's effects on ground water flow and quality.



Salty pore water being squeezed out of sediment cored from the Chesapeake Bay impact crater. Sections of the core are subjected to high pressure in a specialized cylinder-and-piston device, forcing a few milliliters of pore water into a small syringe. Chemical analyses reveal complex flow and mixing around the crater, and the original seawater to be possibly over 2 million years old.

Avian Influenza

The Commonwealth recently experienced an outbreak of avian influenza, which caused potential environmental problems. Avian influenza is highly contagious and, before it could be brought under control, there were 4.7 million turkeys and chickens that had to be destroyed. Thus, disposal of the carcasses became an environmental issue. Burying the carcasses in trenches onsite on the individual farms was considered and rejected because of the potential impact to ground water resources. It was feared that nitrates would be released to the ground water from the onsite disposal.

Arrangements were made with several of the larger, lined sanitary landfills across the Commonwealth for the disposal. The landfill operators cooperated with the poultry industry and DEQ for the quick and efficient disposal in a manner that would stop the spread of the disease.

The transporters of the carcasses had to use lined trailers to ensure containment of the disease and the carcasses were covered with soil as soon as they were placed in the landfills.

Water and Waste Permit Fees Triple

The General Assembly tripled the water and waste permit fees for the next two years in an effort to assist those programs during the current budget shortfall. Through emergency regulations, the fees will triple the current cost for permits and permit amendments. The emergency regulations have a "sunset" clause that terminates the tripled costs on June 30, 2003.

However, the DEQ has been tasked with evaluating the current permit fees and development of new facility permit application fees for the water and waste programs by July 1, 2003. The regulations must reflect a portion of the actual costs of administering the programs (20% for the waste program). It is likely that there will be a substantial increase in cost for permits and permit amendments in the water and waste programs.

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are distinguished from the more publicly discussed, agricultural droughts. Periodic rainfall in the spring and summer can potentially remedy agricultural droughts, however, moderate summer rains do not provide sufficient recharge capacity for hydrologic droughts. The ground water implications were a common subject of discussion as many Virginia localities need new wells. Several counties sought disaster designation to receive aid to counter drought-related causes. Also, as a result of the lack of ground water support for stream flows, major reservoirs have sought and received variances to limit discharges. The management of drought conditions has permeated the year.

Other reports that were shared during Steering Committee meetings included responses to avian influenza and the disposal of millions of birds, well-

head protection and source water protection strategies, and emergency contamination response plans. Karst topography and plans for sink hole management, development, nutrient management, and education and emergency plans were topics that pertained to a large part of western Virginia. Fred Cunningham of DEQ's Underground Storage Tank program led a PowerPoint presentation concerning DEQ's approach for responding to leaking heating oil tanks. The Steering Committee also learned more about the Coastal Plain through USGS studies and hearing firsthand about the ongoing research on the Chesapeake Bay Impact Crater from Randy McFarland of USGS. The crater is thought to be the result of an asteroid impact in the Pleistocene era (see article *Ground Water Studies in Virginia by the U.S. Geological Survey During 2002* on page 6).

The Steering Committee is still planning potential field trips for meetings and the core sampling process in the coastal plain continues to be anticipated as a potential site.

This year we would also like to welcome a new member to the Ground Water Protection Steering Committee. Keisha Parker has joined us from the Virginia Department of Agriculture and Consumer Services where she is a Policy Analyst in the Office of Policy, Planning and Research.



*Ground Water Festival 2001.
See Article on page 5*

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system, deep system, mixed systems, etc.) more specific springhead protection strategies may be developed. Sample hydrographs from a shallow and a deep spring are shown in the figure. The shallow spring responds rapidly to a rainfall event through increased flow. The second hydrograph represents a spring with a deeper flow path and shows little variation in discharge after local rain events.

Chemical analyses of spring water reveal that shallow springs (such as the one shown in the first hydrograph) are susceptible to agricultural contamination. This shallow spring has elevated levels of nitrate and phosphate, while nearby deep wells have much lower concentrations of these two contaminants.

Knowing possible sources for spring water is only the first step in springhead protection. Once a general knowledge of flow pathways to the springhead is known, more specific strategies must be developed to protect these valuable spring water resources.

*For more information, contact
Tom Burbey at Virginia Tech:
tjburbey@vt.edu or (540) 231-6696.*



Patrick Fleming, DEQ Environmental Education, leads students in a session about the Hydrologic Cycle.

Look for GWPSC meeting summaries and announcements ON THE WEB!

House Bill 587, which went into effect on July 1, 2002, requires all public bodies created in the executive branch and subject to the provisions of the Freedom of Information Act (FOIA) to post minutes of their meetings on the Internet. The Steering Committee's meeting summaries and meeting announcements will be posted to the Regulatory Town Hall. You can find this information at www.townhall.state.va.us

Warren County Non-Carbonate Aquifer Appraisal

<http://va.water.usgs.gov/projects/va142.html>

Frederick County Carbonate Aquifer Appraisal

<http://va.water.usgs.gov/va134/index.htm>



Rosalie Coultrip, Northumberland Co. Health Department, discusses on-site sewage disposal with participants at the 2001 Ground Water Festival.

New Publications

The Department of Mines, Minerals and Energy, Division of Mineral Resources has published a CD entitled "A Hydrogeologic Database for Fluvanna County, Virginia", Publication 158, by N. H. Evans and K. K. Hostettler.

Call (434) 951-6341 to order.

Virginia Cooperative Extension's Household Water Quality Education Program has available three reports of water testing results for the following localities:

Greensville, Surry, and Sussex Counties; Charlotte, Lunenburg, and Prince Edward Counties; Hanover and Henrico Counties.

*Requests for copies should be directed to Blake Ross at Virginia Tech:
(540) 231-4702.*

3 issues of the CBLAD newsletter are available online:

www.cblad.state.va.us

Individuals can also request to be added to the mail or e-mail list by calling

1-800-CHESBAY, or writing:

The Chesapeake Bay Local Assistance Department

James Monroe Building

101 North 14th Street, 17th Floor

Richmond, Virginia 23219

or faxing a request to (804) 225-3447.

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